We claim:

1. A process for preparing a nickel(0)-phosphous ligand complex containing at least one nickel central atom and at least one phosphorus ligand, which comprises reducing a nickel(II)-ether adduct in the presence of at least one phosphorus ligand.

2. A process as claimed in claim 1, wherein the nickel(II)-ether adduct is prepared by dissolving a nickel halide in water, admixing with an ether and an organic nitrile, optionally with stirring, and then removing water and any ether.

3. A process as claimed in claim 1 or 2, wherein the nickel(II)-ether adduct contains an ether which is selected from the group consisting of tetrahydrofuran, dioxane, diethyl ether, diisopropyl ether, dibutyl ether, ethylene glycol dialkyl ether, diethylene glycol dialkyl ether and triethylene glycol dialkyl ether.

4. A process as claimed in any of claims 1 to 3, wherein the at least one phosphorus ligand is selected from the group consisting of phosphines, phosphites, phosphinites and phosphonites.

5. A process as claimed in claim 4, wherein the phosphorus ligand is bidentate.

6. A process as claimed in any of claims 1 to 5, wherein the phosphorus ligand stems from a ligand solution which has already been used as a catalyst solution in hydrocyanation reactions.

7. A process as claimed in any of claims 1 to 6, wherein the reducing agent is selected from the group consisting of metals which are more electropositive than nickel, metal alkyls, electrical current, complex hydrides and hydrogen.

8. A process as claimed in any of claims 1 to 7, wherein the reduction is carried out in the presence of a solvent which is selected from the group consisting of organic nitriles, aromatic or aliphatic hydrocarbons and mixtures thereof.

9. A process as claimed in any of claims 1 to 8, which comprises the following process steps:

   (1) preparing a solution or suspension of the at least one nickel(II)-ether adduct and of the at least one ligand in a solvent under inert gas,

(2) stirring the solution or suspension stemming from process step (1) at a temperature of from 20 to 120°C for a period of from 1 minute to 24 hours for precomplexation,

(3) adding the reducing agent at a temperature of from 20 to 120°C to the solution or suspension stemming from process step (2),

(4) stirring the solution or suspension stemming from process step (3) at a temperature of from 20 to 120°C.

10. A mixture comprising nickel(0)-phosphorus ligand complexes, obtainable by a process as claimed in any of claims 1 to 9.

11. The use of the mixtures comprising nickel(0)-phosphorus ligand complexes as claimed in claim 10 in the hydrocyanation and isomerization of alkenes and in the hydrocyanation and isomerization of unsaturated nitriles.

12. A process for preparing a nickel(II)-ether adduct, which comprises dissolving a nickel(II) halide in water, admixing with an ether and a diluent, optionally with stirring, and then removing water and any excess ether.

13. A process as claimed in claim 12, wherein the nickel(II) halides are selected from the group consisting of nickel(II) chloride, nickel(II) bromide and nickel(II) iodide.

14. A process as claimed in claim 12 or 13, wherein the nickel(II)-ether adduct is prepared by a process for removing water from a mixture comprising the corresponding aqueous nickel(II) halide and the corresponding ether, by admixing the mixture with a diluent whose boiling point, in the case that the diluent mentioned does not form an azeotrope with water under the pressure conditions of the distillation mentioned below, is higher than the boiling point of water and is liquid at this boiling point of water, or which forms an azeotrope or heteroazeotrope with water under the pressure and temperature conditions of the distillation mentioned below, and distilling the mixture comprising the aqueous nickel(II) halide, the ether and the diluent to remove water or the azeotrope mentioned or the heteroazeotrope mentioned from this mixture to obtain an anhydrous mixture comprising nickel(II) halide and said diluent.

15. A process as claimed in claim 14, wherein the diluent is an organic diluent having at least one nitrile group.

16. A process as claimed in any of claims 12 to 15, wherein an ether is used which is selected from the group consisting of tetrahydrofuran, dioxane, diethyl ether,

diisopropyl ether, dibutyl ether, ethylene glycol dialkyl ether, diethylene glycol dialkyl ether and triethylene glycol dialkyl ether.

We claim:

1. A process for preparing a nickel(0)-phosphorus ligand complex comprising at least one nickel central atom and at least one phosphorus ligand, which comprises reducing a nickel(II)-ether adduct in the presence of at least one phosphorus ligand selected from the group consisting of phosphites and phosphonites and phosphines and phosphinites with three aromatic substituents.

2. The process according to claim 1, wherein the nickel(II)-ether adduct comprises an ether which is selected from the group consisting of tetrahydrofuran, dioxane, diethyl ether, diisopropyl ether, dibutyl ether, ethylene glycol dialkyl ether, diethylene glycol dialkyl ether and triethylene glycol dialkyl ether.

3. The process according to claims 1 and 2, wherein the phosphorus ligand is bidentate.

4. The process according to any of claims 1 to 3, wherein the phosphorus ligand stems from a ligand solution which has already been used as a catalyst solution in hydrocyanation reactions.

5. The process according to any of claims 1 to 4, wherein the reducing agent is selected from the group consisting of metals which are more electropositive than nickel, metal alkyls, electrical current, complex hydrides and hydrogen.

6. The process according to any of claims 1 to 5, wherein the reduction is carried out in the presence of a solvent which is selected from the group consisting of organic nitriles, aromatic or aliphatic hydrocarbons and mixtures thereof.

7. The process according to any of claims 1 to 6, which comprises the following process steps:

   (1) preparing a solution or suspension of the at least one nickel(II)-ether adduct and of the at least one ligand in a solvent under inert gas,

   (2) stirring the solution or suspension stemming from process step (1) at a temperature of from 20 to 120°C for a period of from 1 minute to 24 hours for precomplexation,

   (3) adding the reducing agent at a temperature of from 20 to 120°C to the solution or suspension stemming from process step (2),

(4) stirring the solution or suspension stemming from process step (3) at a temperature of from 20 to 120°C.

8. A mixture comprising nickel(0)-phosphorus ligand complexes, obtainable by a process according to any of claims 1 to 7.

9. The use of the mixtures comprising nickel(0)-phosphorus ligand complexes according to claim 8 in the hydrocyanation and isomerization of alkenes and in the hydrocyanation and isomerization of unsaturated nitriles.

10. A process for preparing a nickel(0)-phosphorus ligand complex according to any of claims 1 to 9, which comprises dissolving a nickel(II) halide in water, admixing with an ether and a diluent, if appropriate with stirring, and then removing water and any excess ether.

11. The process according to claim 10, wherein the nickel(II) halides are selected from the group consisting of nickel(II) chloride, nickel(II) bromide and nickel(II) iodide.

12. The process according to claim 10 or 11, wherein the nickel(II)-ether adduct is prepared by a process for removing water from a mixture comprising the corresponding aqueous nickel(II) halide and the corresponding ether, by admixing the mixture with a diluent whose boiling point, in the case that the diluent mentioned does not form an azeotrope with water under the pressure conditions of the distillation mentioned below, is higher than the boiling point of water and is liquid at this boiling point of water, or which forms an azeotrope or heteroazeotrope with water under the pressure and temperature conditions of the distillation mentioned below, and distilling the mixture comprising the aqueous nickel(II) halide, the ether and the diluent to remove water or the azeotrope mentioned or the heteroazeotrope mentioned from this mixture to obtain an anhydrous mixture comprising nickel(II) halide and said diluent.

13. The process according to claim 12, wherein the diluent is an organic diluent having at least one nitrile group.

14. The process according to any of claims 10 to 13, wherein an ether is used which is selected from the group consisting of tetrahydrofuran, dioxane, diethyl ether, diisopropyl ether, dibutyl ether, ethylene glycol dialkyl ether, diethylene glycol dialkyl ether and triethylene glycol dialkyl ether.